40′, two large and three small bergs; N. 48° 09′, W. 48° 47′, two bergs.

11th.—N. 46° 54′, W. 48° 25′, a berg two hundred by eighty feet.

11–12th.—From N. 53° 13′, W. 50° 48′, to Point Amour, several very large and small bergs.

12th.—N. 53° 08′, W. 50° 50′, one small berg; N. 52° 36′, W. 53° 00′, two large bergs; N. 47° 52′, W. 48° 29′, a large square berg thirty to forty feet high; N. 47° 40′, W. 49° 07′, a small peaked berg.

13th.—N. 46° 40′, W. 47° 50′, two large and one small berg; N. 48° 07′, W. 49° 27′, a large and a small berg and large pieces; N. 47° 49′, W. 49° 58′, two large bergs; N. 47° 57′, W. 49° 11′, one medium-sized berg; N. 48° 00′, W. 49° 20′, two large bergs fifteen miles apart.

14th.—N. 46° 21′, W. 48° 22′, a large and a small berg; N. 48° 15′, W. 48° 55′, three bergs; N. 47° 35′, W. 49° 15′, three large bergs about one hundred and fifty feet high, irregular shape, peaked at ends.

15th.—N. 46° 40′, W. 47° 50′, two large and a small berg and several pieces of ice; N. 47° 28′, W. 49° 25′, bergs.

17th.—N. 46° 50′, W. 48° 12′, three very large and several small bergs at intervals of several miles.

19th.—N. 47° 29′, W. 51° 00′, a small berg.

21st.—N. 47° 40′, W. 50° 06′, a high berg with complete arch through the centre.

23d.—From Belle Isle to 50′ east, five moderate-sized bergs; N. 52° 15′, W. 53° 28′, two large bergs; three bergs near Belle Isle.

24th.—N. 48° 52′, W. 46° 56′, a small berg; from N. 48° 22′, W. 48° 27′, to N. 48° 01′, W. 49° 12′, three bergs and small pieces of ice.

25th.—N. 48° 03′, W. 48° 32′, a berg; N. 48° 26′, W. 48° 02′, two bergs and detached pieces.

26th.—N. 47° 41′, W. 48° 29′, a large berg; N. 48° 59′, W. 46° 48′, a small berg; N. 48° 32′, W. 47° 55′, very large bergs; N. 53° 00′, W. 52° 06′, two large bergs, and from this position to off Belle Isle on the 27th, a number of large bergs; from N. 52° 00′, W. 54° 55′, to N. 52° 09′, W. 54° 21′, four large bergs right in the track of vessels bound through the Straits of Belle Isle.

27th.—From ninety miles from Belle Isle to entrance of straits, several very large bergs.

28th.—N. 48° 30′, W. 46° 51′, a small berg.

29th.—N. 52° 22′, W. 53° 25′, two small bergs.

FOG IN SEPTEMBER.

The limits of fog-belts west of the fortieth meridian are shown on chart i by dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on nineteen dates, as compared with twenty-two dates for August, 1889, and sixteen dates for September, 1888. Between the fifty-fifth and sixty-fifth meridians fog was reported for six dates, as compared with six dates for August, 1889, and twelve dates for September, 1888. West of the sixty-fifth meridian fog was reported on eight dates, as compared with nine dates for August, 1889, and eleven dates for September, 1888. Compared with the preceding month there has been a slight decrease in fog frequency over and near the Grand Banks, while to the west of the fifty-fifth meridian the aggregate number of days for which fog was reported was the same for each month. Fog was reported for seven dates along the steamship track north of Newfoundland. Fog was reported over and near the Grand Banks on the 1st, 15th, and 15th to 18th, and in the ice region north of Newfoundland on the 6th, 7th, and 8th, with variable winds and relatively high barometric pressure; on the remaining dates for which fog was reported in those regions the approach or passage of areas of low pressure was noted. Between the fifty-fifth and sixty-fifth meridians fog was reported on the 1st with northeasterly winds and high pressure, and from the 5th to the 9th, inclusive, within the area of high barometer and variable or easterly winds that occupied that region during the approach of the cyclone from the West Indies to the middle Atlantic coast. West of the sixty-fifth meridian dense fog attended the approach of the West Indian hurricane from the 6th to the 9th; during the 14th, 15th, and 16th, fog was reported in that region with southeasterly winds and high pressure, and on the 26th, attending the advance off the middle Atlantic coast of an area of low pressure.

The following are limits of fog-areas on the north Atlantic Ocean during September, 1889, as reported by shipmasters:

Date.	Entered.		Cleared.		Date.	Entered.		Cleared.	
	Lat. N.	Lon. W.	Lat. N.	Lon. W.		Lat. N.	Lon. W.	Lat. N.	Lon. W.
	° ′	° ′	° ′	° ′		° ′	° ′	° ′	° ′
1	45 05	51 53	43 21	57 32	16–17	48 08	44 31	46 17	48 15
4	Saint Johns N. F.,		fog at sea.		17	46 50	46 40	46 27	48 00
4	47 30	45 40	46 01	49 21	17–18	48 34	41 50	45 34	49 53
4	48 28	43 11	48 07	44 10	18–19	44 23	48 37	43 31	52 56
4–5	46 13	45 46	45 00	50 08	18–19	46 45	45 30	44 28	52 20
5	42 23	61 24	42 19	61 45	19	Saint Johns, N. F.			
6	42 59	60 39	42 50	61 12	20	47 41	44 17	47 20	45 40
6–7	52 36	52 34	Cape Norman.		20–21	53 15	48 35	52 07	51 15
6–7	41 16	66 32	40 20	69 31	21	46 58	47 10	46 56	47 46
7	43 20	59 55	42 15	62 30	21	45 02	51 10	46 00	45 58
7–8	46 45	49 00	47 50	44 15	22	43 50	50 15	43 30	51 32
7–8	41 12	66 42	40 23	70 09	22	49 25	47 00	47 40	50 45
8	52 04	54 15	51 48	55 30	23	48 18	46 30	48 12	47 00
8	41 00	66 45	40 25	67 53	23–24	48 30	45 57	47 58	47 35
8–9	42 20	67 30	42 23	65 00	23	52 45	52 22	53 10	50 51
9	49 18	63 36	49 14	65 00	24	46 10	45 16	46 45	43 15
9	41 00	68 14	41 17	67 45	25	55 30	41 00	56 00	37 13
14–15	New York.		40 15	73 52	26	40 57	73 23	40 57	73 23
15	42 50	50 30	42 35	53 00	28–29	54 36	43 38	55 51	33 47
15–16	42 41	66 05	42 25	70 00	28–29	46 35	52 21	46 25	52 44
16	47 36	43 14	47 15	44 48					

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for September, 1889, is exhibited on chart ii by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Signal Service represents the mean of the maximum and minimum temperatures.

In September, 1889, the mean temperature was highest in the extreme southeastern part of California and the adjoining part of Arizona, where it rose above 85°, the highest mean reading, 91°.3, being reported at Cactus, Cal. In southeastern California, south of the thirty-sixth parallel, southern Nevada, central and western Arizona, extreme southern Louisiana, central and southern Florida, and at one station each in south-central Alabama, and eastern Texas the mean values were above 80°. South of a line traced irregularly westward from North Carolina to southern New Mexico, in central Kansas, and in the Sacramento and San Joaquin valleys, Cal., the mean temperatnre was above 70°. Exclusive of Pike's Peak, Colo., where 31°.7 was reported, monthly mean temperature below 32° was not reported, and the only stations noting monthly mean values below 50° were located in central Colorado, south-central Oregon, central Montana, southeastern Idaho, central Utah, northwestern Wyoming, and in the British Possessions north of Dakota and Montana. At Mount Washington, N. H., and Mount Killington, Vt., the mean temperature was 43°.2 and 47°.6, respectively.

The mean temperature was below the normal, except at sta-

tions in the Saint Lawrence Valley, the Canadian Maritime Provinces, northern New England, northeastern New York, the north-central and northeastern parts of the upper lake region, at Jacksonville, Fla., in the southern plateau region, and along the Pacific coast south of the Columbia River. The greatest departures below the normal temperature were noted in north-central Texas and Indian Territory, where they exceeded 5°. At stations and in districts where the mean temperature was above the normal the departures were less than 4°. Considered by districts, the greatest average departure below the normal temperature, 5°.8, occurred on the southeastern slope of the Rocky Mountains; in the west Gulf states the average departure below the normal temperature was 3°.7; in the Rio Grande Valley, 3°.2; in the Ohio Valley and Tennessee, 3°.1; in the Missouri Valley, 2°.9; in the middle Atlantic states, 2°.6; in the upper Mississippi valley and middle plateau region, 2°.4; over the middle-eastern slope of the Rocky Mountains, 2°.2; in the east Gulf states and over the northeastern slope of the Rocky Mountains, 2°.0; and in the south Atlantic states, Florida peninsula, upper and lower lake region, extreme Northwest, northern plateau region, and north Pacific coast, less than 2°.0. The greatest average departure above the normal temperature, 3°.4, occurred on the south Pacific coast; on the middle Pacific coast the average departure above the normal was 2°.8, and in the southern plateau region 0°.2. In New England the mean temperature for the month averaged normal.

The following are some of the most marked departures from the normal at the older established Signal Service stations:

Above normal.	°	Below normal.	°
Sydney, C. B. I.	4.0	Abilene, Tex	6.2
San Francisco, Cal	3.6	Fort Sill, Ind. Ter	5.4
Los Angeles, Cal	3.6	Leavenworth, Kans	4.3
Red Bluff, Cal	3.0	Saint Louis, Mo	4.0
Parry Sound, Ont	2.0	Fort Custer, Mont	3.6

DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for September, 1889; (4) the departure of the current month from the normal; (5) and the extreme monthly means for Septemper, during the period of observation and the years of occurrence:

State and station.	County.	(1) Normal for the month of Sept.	(2) Length of record.	(3) Mean for Sept., 1889.	(4) Departure from normal.	(5) Extreme monthly mean temperature for Sept.			
						Highest.	Year.	Lowest.	Year.
Arkansas.		°	*Years*	°	°	°		°	
Lead Hill	Boone	71.0	8	68.2	−2.8	76.4	1884	67.5	1883
California.									
Sacramento	Sacramento	69.0	35	63.4	−5.6	76.0	1853	61.9	1884
Colorado.									
Fort Lyon	Bent	65.8	20	65.4	−0.4	72.0	1867	55.9	1868
Connecticut.									
Middletown	Middlesex	60.6	21	61.8	+1.2	63.8	1870	52.4	1871
Florida.									
Merritt's Island	Brevard	79.3	5	79.4	+0.1	80.0	1884	78.4	1888
Georgia.									
Forsyth	Monroe	76.5	15	75.8	−0.7	82.2	1884	72.8	1888
Illinois.									
Peoria	Peoria	67.0	33	64.9	−2.1	73.4	1865	60.2	1866
Riley	McHenry	60.8	23	59.3	−1.5	68.4	1865	56.4	1888
Indiana.									
Vevay	Switzerland	68.5	23	65.3	−3.2	76.3	1881	63.0	1869
Iowa.									
Cresco	Howard	58.8	16	57.7	−1.1	64.3	1877	54.3	1873
Monticello	Jones	61.4	35	61.1	−0.3	73.1	1865	51.0	1856
Logan	Harrison	65.2	15	62.2	−3.0	70.2	1886	61.3	1876
Kansas.									
Lawrence	Douglas	67.0	26	63.2	−3.8	71.2	1886	61.8	1868
Wellington	Sumner	69.1	10	66.5	−2.6	74.5	1884	63.8	1883
Louisiana.									
Grand Coteau	Saint Landry	78.0	6	76.4	−1.6	81.6	1884	75.3	1888
Maine.									
Gardiner	Kennebec	58.4	49	60.7	+2.3	64.3	1841	53.3	1845
Maryland.									
Cumberland	Allegany	62.0	30	64.0	+2.0	70.0	1881	55.7	1863

Deviations from normal temperatures—Continued.

State and station.	County.	(1) Normal for the month of Sept.	(2) Length of record.	(3) Mean for Sept., 1889.	(4) Departure from normal.	(5) Extreme monthly mean temperature for Sept.			
						Highest.	Year.	Lowest.	Year.
Massachusetts.		°	*Years*	°	°	°		°	
Amherst	Hampshire	60.2	53	61.0	+0.8	67.4	1881	50.9	1858
Newburyport	Essex	60.4	11	61.2	+0.8	64.4	1884	57.0	1888
Somerset	Bristol	64.3	17	65.8	+1.5	69.2	1881	61.6	1885
Michigan.									
Kalamazoo	Kalamazoo	61.9	13	62.4	+0.5	69.0	1881	55.2	1879
Thornville	Lapeer	62.0	12	62.6	+0.6	71.0	1881	57.8	1879
Minnesota.									
Minneapolis	Hennepin	58.2	24	58.2	0.0	67.7	1865	49.9	1868
Montana.									
Fort Shaw	Lewis & Clarke	56.0	21	55.2	−0.8	61.3	1867	43.2	1873
New Hampshire.									
Hanover	Grafton	56.9	53	58.7	+1.8	62.9	1881	50.3	1848
New Jersey.									
Moorestown	Burlington	65.3	26	63.7	−1.6	73.6	1881	60.6	1871
South Orange	Essex	63.5	19	62.8	−0.7	71.8	1881	53.0	1871
New York.									
Cooperstown	Otsego	55.3	35	58.7	+3.4	66.7	1881	53.3	1860, '63
Palermo	Oswego	58.9	29	60.1	+1.2	65.1	1881	54.5	1883
North Carolina.									
Lenoir	Caldwell	65.0	17	65.8	+0.8	71.1	1884	55.2	1878
Ohio.									
N'th Lewisburgh	Champaign	64.3	57	64.3	0.0	73.0	1881	55.0	1835
Wauseon	Fulton	62.6	19	61.0	−1.6	71.1	1881	57.2	1883
Oregon.									
Albany	Linn	60.8	11	61.6	+0.8	64.7	1888	53.3	1884
Eola	Polk	59.5	19	61.2	+1.7	65.3	1876	51.2	1881
Pennsylvania.									
Dyberry	Wayne	58.1	22	57.2	−0.9	66.9	1881	52.5	1871
Grampian Hills	Clearfield	60.4	25	60.4	0.0	72.0	1881	54.2	1871
Wellsborough	Tioga	59.1	10	58.8	−0.3	73.8	1881	52.3	1883
South Carolina.									
Statesburgh	Sumter	70.4	8	70.9	+0.5	77.9	1881	69.9	1888
Tennessee.									
Austin	Wilson	72.0	18	69.7	−2.3	78.2	1881	67.6	1875
Milan	Gibson	70.0	6	67.4	−2.6	73.8	1884	66.6	1883
Texas.									
New Ulm	Austin	77.6	17	74.6	−3.0	81.0	1872	74.6	1889
Vermont.									
Strafford	Orange	59.6	16	61.1	+1.5	64.4	1879	56.2	1876
Virginia.									
Bird's Nest	Northampt'n	71.0	20	68.2	−2.8	79.1	1881	61.2	1877
Wisconsin.									
Madison	Dane	61.0	12	61.2	+0.2	65.3	1854	57.8	1888
Washington.									
Fort Townsend	Jefferson	57.5	14	55.5	−2.0	63.5	1874	53.9	1884

The above table shows that at New Ulm, Tex., with a record of seventeen years, the mean temperature for the current month was 1.0° below the lowest mean reported for the corresponding month of previous years, noted in 1876. Unusually high mean temperatures are not shown by this table.

MAXIMUM AND MINIMUM TEMPERATURES.

The highest temperature reported at regular stations of the Signal Service was noted in the Gila, lower Colorado, San Joaquin, and Sacramento valleys, where the absolute maximum temperature was above 100°, the highest reading, 109°, being registered at Fort McDowell, Ariz. At El Paso, Tex., the temperature rose to 100°. In South Carolina, Georgia, Florida, the Gulf states, except along the Texas coast, and from Manitoba southward to the Rio Grande Valley; in parts of the Ohio Valley and Tennessee, and the upper Mississippi valley, and in southern Michigan; over southern and western Arizona, southern Nevada, California, except along the coast north of San Francisco, and in southwestern Oregon, the maximum temperature at Signal Service stations was 90° or more. The lowest maximum temperature was reported in the extreme northwest part of Washington, where it fell to or below 70°. Along the coast of northern California, over the more northern part of the upper Lake region, and at stations on the New England coast the maximum temperature was below 80°. At the following named stations the highest absolute temperature noted for September during the respective periods of observation was reported: Moorhead, Minn., nine years record, 2° above maximum of 1885; Saint Vincent, Minn., ten years record, 5° above maximum of 1883; Denver, Colo., seventeen years record, 1° above maximum of 1878; Fort Thomas, Ariz., ten years record, 2° above maximum of 1883 and 1888; Fort Canby, Wash., seven years record, the same as maximum of 1883; Olympia, Wash., thirteen years

record, 2° above maximum of 1888; New Orleans, La., nineteen years record, the same as maximum of 1887; Eastport, Me., seventeen years record, the same as maximum of 1884. Reports of the older established Signal Service stations show that the highest temperature recorded for September was generally noted in New England, the middle Atlantic states, North Carolina, northern Louisiana, eastern Tennessee, Ohio Valley, lower lake region, upper Mississippi and Missouri valleys, and the middle, eastern, and southeastern slopes of the Rocky Mountains in 1881; in the east and middle Gulf states and western Tennessee in 1887; at Lake Superior stations in 1874; in extreme southern Texas in 1877; in Arizona and New Mexico in 1879 or 1883; and in the northern plateau region, the north Pacific coast, and northern California in 1888; elsewhere the periods of occurrence were irregular. The following are maximum readings in the several states and territories where maximum temperature of 100°, or over, was reported for for September, 1889, as shown by reports of United States Army post surgeons and state weather service and voluntary observers: Citronelle, Ala., 100°; Fort Mojave, Ariz., 113°; Mojave, Cal., 116°; Fort Lyon and Las Animas, Colo., 101°; Onida, Dak., 100°; Lake City, Fla., 102°; Andersonville, Quitman, and Smithville, Ga., 100°; Collyer, Fremont, and Oakley, Kans., 102°; Murray, Ky., 101°; Cameron, La., 110°; Louisville, Miss., 102°; Creighton, Nebr., 101°; El Dorado, Nev., 110°; Deming, N. Mex., 100°; Hartley, Tex., 102°; Saint George, Utah, 102°; and Wauzeka, Wis., 100°. Among high temperatures noted at Signal Service stations for September are: 100° at New Haven, Conn., 100° at Boston, Mass., 101° at Sandy Hook, N. J., 100° at New York City., 102° at Philadelphia, Pa., 101° at Baltimore, Md., 104° at Washington, D. C., 101° at Pittsburgh, Pa., 101° at Saint Louis, Mo., and 101° at North Platte, Nebr., all in 1881; 106° at Rio Grande City, Tex., in 1877; 100° at Fort Buford, Dak., and 101° at Leavenworth, Kans., in 1882; 107° at Fort Sully, Dak., in 1874; 102° at Fort Supply, Ind. T., in two or more years; 104° at El Paso, Tex., and 113° at Yuma, Ariz., in 1879; 112° at Fort McDowell, Ariz., in 1885; 114° at Phœnix, Ariz., in 1883; 100° at Boisé City, Idaho, and 102° at Ashland, Oregon, in 1888.

The lowest temperature reported at regular stations of the Signal Service, except at Mount Washington, N. H., Mount Killington, Vt., and Fort Klamath, Oregon, where 14°, 20°, and 16°, respectively, were recorded, was noted in central and northern Montana, where values falling below 25° were reported. The minimum temperature fell below 30° north of a line traced from central Minnesota to southeastern Montana, and thence southward to central New Mexico, whence it is continued northwest and west over the middle plateau region to east-central California, and from that region northeast and north to the British Possessions north of Washington Territory. Minimum temperature below 30° was also reported in northern New England and south-central Michigan. The reports of United States Army post surgeons and state weather service and voluntary observers show the following absolute minimum temperatures for states and territories where readings of 32° or below were reported: Williams, Ariz., 30°; Fort Gaston, Cal., 29°; Pike's Peak, Colo., 2°; Alma and Breckenridge, Colo., 8°; Dolly Varden Mines, Colo., 5°; Steele, Dak., 22°; Soda Springs, Idaho, 18°; Riley, Ill., 27°; Point Isabel, Ind., 30°; Fayette, Iowa, 23°; McAllister and Tribune, Kans., 28°; Calais and Mayfield, Me., 28°; Ludlow, Mass., 30°; Evart and Hart, Mich., 20°; Pokegama Falls, Minn., 21°; Frankford, Mo., 21°; Fort Logan, Mont., 16°; Fort Robinson and Hay Springs, Nebr., 24°; Elko, Nev., 13°; North Chesterfield, N. H., 25°; Fort Union, N. Mex., 24°; Angelica, N. Y., 30°; Findlay, Ohio, 30°; Beulah, Oregon, 24°; Wellsborough, Pa., 30°; Mount Pleasant and Nephi, Utah, 25°; Weathersfield Centre, Vt., 17°; Boiar and Lexington, Va., 32°; Fort Spokane, Wash., 25°; Clarkesburgh, W. Va., 30°; Neillsville, Wis., 22°, and Fort D. A. Russell, Wyo., 22°. At the following-named stations of the Signal Service the minimum temperature was as low or lower than previously recorded for September during the periods of observation: Pensacola, Fla., ten years record, the same as minimum of 1888; Galveston, Tex., nineteen years record, the same as minimum of 1887; Brownsville, Tex., fourteen years record, 1° below minimum of 1883; Chicago, Ill., eighteen years record, 1° below minimum of 1888; Davenport, Iowa, eighteen years record, 1° below minimum of 1888; Des Moines, Iowa, twelve years record, 1° below minimum of 1888; Dubuque, Iowa, seventeen years record, the same as minimum of 1888; Keokuk, Iowa, nineteen years record, 2° below minimum of 1888; Leavenworth, Kans., nineteen years record, 2° below minimum of 1876; Fort Assinniboine, Mont., ten years record, 3° below minimum of 1884; Fort Maginnis, Mont., eight years record, 2° below minimum of 1884; Helena, Mont., ten years record, 2° below minimum of 1882; Fort Supply, Ind T., seven years record, 3° below minimum of 1881; Fort Sill, Ind, T., thirteen years record, 6° below minimum of 1878; El Paso, Tex., twelve years record, the same as minimum of two or more years; Fort Apache, Ariz., eleven years record, the same as minimum of 1880 and 1882; Fort Grant, Ariz., twelve years record, 7° below minimum of 1881; San Carlos, Ariz., nine years record, the same as minimum of 1882 and 1887; Salt Lake City, Utah, sixteen years record, 1° below minimum of 1881; Boisé City, Idaho, thirteen years record, the same as minimum of 1886; Ashland, Oregon, six years record, the same as minimum of two or more years; Fort Klamath, Oregon, six years record, 1° below minimum of 1887; Spokane Falls, Wash., nine years record, 1° below minimum of 1884; Port Angeles, Wash., five years record, the same as minimum of 1887; Astoria, Oregon, five years record, 6° below minimum of 1886; Portland, Oregon, seventeen years record, 1° below minimum of two or more years; and Roseburgh, Oregon, twelve years record, the same as minimum of 1881. At a majority of stations in New England, the middle and south Atlantic states, the east and middle Gulf states, the Ohio valley and Tennessee, and the upper Mississippi valley the lowest September temperature for preceding years was noted in 1888; in Arkansas and northern Louisiana in 1881 or 1883; in northern Minnesota and northern Dakota in 1883; in Montana in 1884; and in northwestern Washington Territory in 1887; elsewhere the periods of occurrence were irregular. In September, 1889, the highest minimum temperature was noted at stations in southern Florida, where it was above 70°, and the minimum values were above 50° on the south Atlantic and Gulf coasts, in the Mississippi valley northward to Tennessee, and from southwestern Arizona northwest over western and central California to the Sacramento Valley.

LIMITS OF FREEZING WEATHER.

The southern and western limits of freezing weather are shown on chart ii by a line traced from extreme northeastern Minnesota irregularly southward to central Iowa, thence northwest to central Dakota, whence it is continued southward to central Kansas, southwest to east-central Arizona, northward to northern Utah, south-southwest to eastern California, northward to the Columbia Valley, where it curves eastward into Idaho, and thence to northwestern Washington Territory.

RANGES OF TEMPERATURE.

The greatest and least daily ranges of temperature at regular stations of the Signal Service are given in the table of miscellaneous meteorological data. The greatest monthly ranges occurred in eastern Washington Territory, Idaho, northern and eastern Montana, Dakota, western Nebraska, western Kansas, northwestern Indian Territory, Colorado, western New Mexico, western Minnesota, east-central Arizona, and within an area extending from southwestern Oregon over northeastern California and northwestern Nevada, where they were 60° or more, whence they generally decreased southward and toward the Atlantic and Pacific coasts. The least monthly ranges were noted over southern Florida, where they were less than 20°; they were less than 30° on the southeast New England and North Carolina coasts, and on the extreme north Pacific coast, and were less than 40° at a majority of stations on the Atlantic, Gulf, and Pacific coasts.

The following are some of the extreme monthly ranges:

Greatest.		Least.	
	°		°
Fort Klamath, Oregon	69.0	Key West, Fla	18.0
Bismarck, Dak	67.0	Block Island, R. I	25.0
Pueblo, Colo	66.0	Hatteras, N. C	26.0
Fort Assinniboine, Mont	65.0	Tatoosh Island, Wash	26.0
San Carlos, Ariz	62.0	Galveston, Tex	31.0
Carson City, Nev	60.0	San Diego, Cal	37.0

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature as observed at the harbors of the several stations; the monthly range of water temperature; and the mean temperature of the air for September, 1889:

Stations.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
	°	°	°	°	°
Boston, Mass	67.2	56.4	10.8	64.3	62.8
Canby, Fort, Wash	62.8	54.5	8.3	57.5	57.8
Cedar Keys, Fla	87.2	79.5	7.7	84.1	79.4
Charleston, S. C	82.8	74.8	8.0	79.9	75.8
Eastport, Me	53.7	51.5	2.2	52.4	58.0
Galveston, Tex	86.5	71.5	15.0	80.7	77.5
Key West, Fla	87.2	81.0	6.2	84.9	81.4
Nantucket, Mass	72.0	62.5	9.5	68.4	63.0
New York City	72.8	59.3	13.5	68.0	65.8
Portland, Oregon	68.8	61.5	7.3	64.7	61.4

FROST.

The following reports of frost injurious to vegetation have been received:

Hay Springs, Nebr.: the heavy frost on the 2d killed vines, etc., and that on the 5th and 6th was very damaging to the corn crop.—*Report of Mr. Wm. Waterman, voluntary observer.* Dodge Centre, Minn., 6th: a heavy frost occurred in the northern portion of this (Dodge) county last night, and caused considerable damage to the corn crop.—*New York Daily Tribune, September* 7. Neceda, Wis., 16th: a heavy frost occurred throughout the cranberry region last night, and as the crop was about half gathered the loss to the growers will be very heavy.—*The Evening Wisconsin, Milwaukee, Wis., September* 16. Sac City, Iowa: the frost on the mornings of the 17th, 18th, and 19th killed the corn blades and tender vegetation.—*Report of Dr. Caleb Brown, voluntary observer.* Dubuque, Iowa, 18th: a heavy frost was reported in this locality and along the line of the Illinois Central Railroad westward last night. It is stated that crops were greatly injured in many places.—*Evening Herald, Duluth, Minn., September* 18. East Tawas, Mich., 18th: a heavy frost occurred during the night, the first one of the season. Considerable damage was done to vines.—*Evening Herald, Duluth, Minn., September* 18. Green Bay, Wis., 18th: reports show that the cranberry crop has suffered considerable damage by frost; in some places the loss is estimated at 50 per cent.—*Report of T. F. Schley, observer, Signal Corps.* Milwaukee, Wis., 19th: the first frost of the season occurred this morning; no special damage was done in this section, but reports from the cranberry district show that considerable damage was done to the cranberry crop.—*Report of S. W. Rhode, observer, Signal Corps.* Lansing, Mich., 22d: the first frost of the season occurred last night, killing all vines and severely touching all corn still uncut.—*Report of N. B. Conger, observer, Signal Corps.* Mottville, Mich.: the frost on the morning of 22d injured corn and vegetation of all kinds.—*Report of Mr. J. A. Hartzler, voluntary observer.* Napoleon, Ohio: the heavy frost on the morning of the 22d killed all tender vegetation and damaged late corn.—*Report of Dr. T. C. Hunter, voluntary observer.* Westerville, Ohio: the frost on the morning of the 22d killed all tender vegetation in this section.—*Report of Mr. John Haywood, voluntary observer.* Ilion, N. Y.: the severe white frost on the 23d killed all garden vegetables.—*Report of Mr. G. A. Trowbridge, voluntary observer.* Canajoharie, N. Y., 23d: a heavy frost occurred in the Mohawk Valley this morning and caused great injury to gardens, vineyards, and buckwheat fields.—*The Oswego, N. Y., Palladium, September* 23. Fremont, Kans.: the frost on the 24th killed vines, plants, and tender vegetables.—*Report of Mr. Ed. Atkin, voluntary observer.* Port Huron, Mich., 27th: killing frost occurred during the night, injuring late corn to some extent.—*Report of H. L. Boyce, observer, Signal Corps.* Detroit, Mich., 27th: the first killing frost of the season occurred this morning; considerable damage was done to celery, tomatoes, and corn.—*Report of E. A. Evans, observer, Signal Corps.* Howe, Nebr.: severe frost occurred on the morning of the 27th, killing all garden vegetables.—*Report of Mr. George D. Carrington, voluntary observer.* Muscatine, Iowa: the frost on the 27th injured all tender vegetation.—*Report of Mr. J. P. Walton, voluntary observer.* Logan, Iowa: the frost on the 27th killed tender vegetables and flowers on low ground.—*Report of M. B. Stern, voluntary observer.*

The above reports show that damaging frost occurred in Nebraska on the 2d; in Minnesota on the 6th; in Wisconsin on the 16th; in Iowa on the 17th; in Iowa, Michigan, and Wisconsin on the 18th; in Iowa and Wisconsin on the 19th; in Michigan and Ohio on the 22d; in New York on the 23d; in Kansas on the 24th; and in Michigan, Nebraska, and Iowa on the 27th. Light frost was reported as far south as northern South Carolina, northern Georgia, northern Alabama, central Texas, southern New Mexico, east-central Arizona, central Nevada, and northern California. No frost injurious to vegetation was reported south of the fortieth parallel, save at Fremont, Kans., where it was noted on the 24th. Reports for preceding years show that the occurrence of killing frost for the current month was seasonable in the districts where it was reported, and that in September the first killing frosts of the season generally occur as far south as the Ohio Valley and the fortieth parallel, east of the Rocky Mountains. In August, 1889, reports of frost injurious to vegetation were received from Galena, Ill., 1st; Grand Rapids, Wis., 4–5th, and Linkville, Oregon, 19th, only.

Frost has been reported for September, 1889, as follows:

1st, Colo., Dak., Nebr., Nev., Oregon. 2d, Colo., Dak., Nebr., Nev., Oregon, Utah, Wyo. 3d, Colo., Nev., Oregon. 4th, Colo., Dak., Idaho, Kans., Mont., Nebr., Nev., Oregon, Utah, Wyo. 5th, Colo., Dak., Iowa, Kans., Minn., Mont., Nebr., Nev., N. Mex., Oregon, Utah, Wyo. 6th, Colo., Dak., Ill., Mo., Nebr., Nev., Oregon, Utah. 7th, Colo., Dak., Nebr., N. Mex., Ohio, Oregon. 8th, Cal., Colo., Nev., Oregon. 9th, Cal., Colo., Dak., Iowa, Nebr., Oregon, Utah. 10th, Cal., Colo., Nev., N. Mex., Oregon, Utah, Wash. 11th, Cal., Colo., Dak., Idaho, Mont., Nev., Oregon, Utah, Wash. 12th, Cal., Colo., Mich., Mont., Nev., Oregon, Utah, Wash. 13th, Ariz., Cal., Colo., Mont., Nev., Oregon, Utah, Wash. 14th, Ariz., Cal., Colo., Dak., Ind. T., Iowa, Mich., Mont., Nev., Oregon, Utah. 15th, Ariz., Colo., Dak., Iowa, Mich., Minn., Mo., Nebr., Nev., Oregon, Utah. 16th, Ariz., Colo., Ill., Iowa, Kans., Mich., Mo., Nebr., Nev., Oregon, Utah, Wis. 17th, Colo., Dak., Ill., Iowa, Ky., Mich., Minn., Mo., Nebr., Nev., Tenn., Utah, Wis. 18th, Colo., Dak., Ga., Ill., Ind., Iowa, Kans., Ky., Mich., Minn., Mo., Mont., Nebr., Nev., Ohio, Pa., Tenn., Utah, Wis. 19th, Ala., Colo., Ga., Ill., Ind., Iowa, Ky., Md., Mich., Minn., Mo., Nebr., Nev., N. Y., Ohio, S. C., Tenn., Wis. 20th, Ala., Colo., Ga., Ill., Iowa, Ky., Mich., Minn., Mo., Nebr., Nev., N. Y., N. C., Ohio, S. C., Tenn., Va., Wis. 21st, Colo., Dak., Ill., Ind., Iowa, Ky., Md., Mass., Mich., Minn., Nev., N. J., N. Y., N. C., Ohio, Tenn., Vt., W. Va., Wis. 22d, Colo., Ill., Ind., Iowa, Ky., Md., Mass., Mich., Nev., N. H., N. J., N. Y., N. C., Ohio, Pa., S. C., Tenn., Utah, Vt., Va., W. Va., Wis. 23d, Colo., Dak., Ill., Ind., Iowa, Me., Mass., Mich., Nev., N. H., N. J., N. Y., Ohio, Pa., R. I., Tenn., Utah, Vt., Va., W. Va. 24th, Ariz., Colo., Conn., Dak., Iowa, Kans., Mass., Mich., Nebr., Nev., N. Mex., N. Y., Ohio, Oregon, Utah, Vt., Wash., Wis. 25th, Ariz., Colo., Dak., Ind. T., Iowa, Kans., Ky., Mich., Mo., Nebr., Nev., Oregon, Utah, Wis. 26th, Ariz., Colo., Dak., Ill., Ind., Iowa, Kans.,

Ky., Mich., Minn., Mo., Nebr., Nev., N. Mex., Ohio, Tex., Utah, Wis. 27th, Colo., Ga., Ill., Ind., Iowa, Kans., Ky., Md., Mass., Minn., Mo., Mont., Nebr., Nev., N. Y., Ohio, Pa., Tenn., Utah, Va., W. Va., Wis. 28th, Ala., Ariz., Colo., Conn., D. C., Ga., Ill., Ind., Iowa, Ky., Md., Mass., Mich., Mo., Nev., Ohio, Pa., R. I., Tenn., Utah, Va., W. Va., Wis. 29th, Colo., Conn., Ky., Mass., Mich., Nev., N. H., N. Mex., N. Y., Pa., Utah, Vt., Wis. 30th, Colo., Nev., N. H., Tenn., Vt.

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for September, 1889, as determined from the reports of nearly 2,000 stations, is exhibited on chart iii. • In the table of miscellaneous meteorological data the total precipitation and the departure from the normal are given for each Signal Service station. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

In September, 1889, the precipitation was greatest in areas in southern Florida, south-central Indian Territory and the adjoining part of north-central Texas, southeastern Kansas, central Kentucky, central New Jersey, southeastern Pennsylvania, eastern Texas, and central Virginia, where it exceeded ten inches, the greatest amount reported, 16.71 inches, being noted at Lehigh, Ind. T. At stations in western Arizona, a greater part of California, west-central Kansas, east-central Mississippi, western Nebraska, western Nevada, south-central Oregon, and northwestern Utah no rainfall was recorded. The following are the greatest and least rainfalls respectively reported in the several states and territories: Alabama, 9.23, at Decatur; 0.57, at Livingston. Arizona, 5.90, at Globe; 0.00, at western stations. Arkansas, 8.08, at Ozone; 0.21, at Pine Bluff. California, 1.52, at Crescent City; 0.00 at a majority of stations. Colorado, 1.48, at La Veta; 0.06, at Las Animas. Connecticut, 7.60, at Voluntown; 2.87, at Vernon Centre. Dakota, 6.25, at Alexandria; 0.37, at Onida and Rapid City. District of Columbia, 4.48, at Washington Barracks; 3.88, at Washington City. Florida, 13.87, at Key West; 0.95, at Micco. Georgia, 8.97, at Toccoa; 1.19, at Fort Gaines. Idaho, 1.06, at Soda Springs; trace, at Era. Illinois, 5.66, at Flora; 1.66, at Winnebago. Indiana, 8.90, at Huntingburgh; 1.39, at Point Isabel. Indian Territory, 16.71, at Lehigh; 1.97, at Fort Supply. Iowa, 7.19, at Washington; 0.70, at Wesley. Kansas, 10.59, at Sedan; 0.00, at several central stations. Kentucky, 12.40, at South Fork; 2.47, at Mount Sterling. Louisiana, 6.80, at Houma; 0.33, at Alexandria. Maine, 6.52, at Mayfield; 0.21, at Kennebec Arsenal. Maryland, 8.65, at Fallston; 3.79, at Barren Creek Springs. Massachusetts, 5.35, at Clinton; 2.20, at Provincetown. Michigan, 5.60, at Sault de Ste. Marie, 0.35, at Highland Station. Minnesota, 6.27, at Moorhead; 0.51, at Saint Paul. Mississippi, 6.60, at Holly Springs; 0.00, at Kosciusko. Missouri, 9.28, at Glasgow; 0.28, at Jerome. Montana, 2.95, at Glendive; 0.06, at Custer. Nebraska, 3.72, at Marquette; 0.00, at Fort Sydney. Nevada, 2.00, at Pioche; 0.00, at western stations. New Hampshire, 7.01, at Mount Washington, and 6.29, at Belmont; 2.92, at Pennichuck Station. New Jersey, 13.13, at Plainfield; 3.17, at Atlantic City. New Mexico, 3.93, at Hillsborough; 0.18, at Albuquerque. New York, 8.21, at Fort Schuyler; 1.82, at Alfred Centre. North Carolina, 5.30, at Lenoir; 0.35, at Grover. Ohio, 7.12, at Georgetown; 0.52, at Toledo. Oregon, 7.51, at Tillamook; 0.00, at south-central stations. Pennsylvania, 10.01, at Kennett Square; 1.88, at Mahoning. Rhode Island, 5.52, at Kingston; 3.41, at Block Island. South Carolina, 5.56, at Greenville; 1.46, at Florence. Tennessee, 9.91, at Clinton; 2.06, at Greeneville. Texas, 15.43, at Gainesville; 0.45, at Epworth and Panhandle. Utah, 1.26, at Saint George; 0.00, at extreme northwest stations. Vermont, 6.30, at East Berkshire; 3.05, at Jacksonville. Virginia, 10.69, at Lynchburgh; 3.07, at Woodstock. Washington Territory, 5.69, at Neah Bay; 0.26, at Fort Walla Walla. West Virginia, 5.94, at Harper's Ferry; 0.69, at Ella. Wisconsin, 4.79, at Fond du Lac; 0.25, at Honey Creek. Wyoming, 0.59, at Camp Sheridan; 0.00, at Fort Laramie.

The precipitation for September, 1889, was above the normal in the Saint Lawrence Valley, southern and western New England, the middle Atlantic states, Florida (south of the thirtieth parallel), northern Georgia, Alabama, extreme southern Louisiana, the Ohio valley and Tennessee, except at Memphis, Tenn., at eastern Lake Erie stations, from northern Minnesota and northeastern Dakota south-southwest over central Nebraska, at stations in central and extreme southeastern Arizona, and extreme western Texas, in west-central and southwestern Washington Territory, and at Los Angeles, Cal.; elsewhere the precipitation was below the average for the month. The most marked departures above the normal were reported in south-central Virginia and extreme southern Florida, where they exceeded seven inches. In the middle Saint Lawrence valley the rainfall exceeded the normal amount by more than five inches, while in extreme southeastern New York, southeastern Tennessee, and the upper valley of the Red River of the North the excess was more than four inches. The greatest departures below the normal precipitation occurred on the south Atlantic coast, in west-central Mississippi, and thence southwestward to the middle west Gulf coast, where they were more than three inches. In districts where the precipitation was in excess the average percentages of the normal were about as follows: New England, 117 per cent.; middle Atlantic states, 143 per cent.; Florida Peninsula, 170 per cent.; east Gulf states, 114 per cent.: west Gulf states, 109 per cent.; Ohio valley and Tennessee, 160 per cent.; extreme Northwest, 165 per cent.; Missouri Valley, 113 per cent.; southeastern slope of the Rocky Mountains, 108 per cent.; south Pacific coast, 567 per cent. In districts where the precipitation was deficient the average percentages of the normal were about as follows: south Atlantic states, 67 per cent.; Rio Grande Valley, 78 per cent.; lower lake region, 84 per cent.; upper lake region, 83 per cent.; upper Mississippi valley, 83 per cent.; northeastern slope of the Rocky Mountains, 75 per cent.; middle eastern slope of the Rocky Mountains, 80 per cent; southern plateau, 93 per cent.; middle plateau, 58 per cent.; northern plateau, 14 per cent.; north Pacific coast, 93 per cent., and middle Pacific coast, 1 per cent. The remarkable percentage of the normal rainfall noted on the south Pacific coast for the current month was due to a monthly rainfall of 0.34 inch at Los Angeles, Cal., where the normal precipitation for September is but .03 inch, and the very low percentage of the normal on the middle Pacific coast was occasioned by an entire absence of measurable rainfall during the month at the stations for which the normal precipitation has been determined.

In the following-named districts the rainfall for August, 1889, was excessive, while for the current month it was deficient: Rio Grande Valley, middle eastern slope of the Rocky Mountains, and the north and middle Pacific coasts. In New England, the middle Atlantic states, the east and west Gulf states, Ohio valley and Tennessee, extreme Northwest, southeastern slope of the Rocky Mountains, and the south Pacific coast there was a deficiency in August and an excess of rainfall in September, 1889. In the Florida peninsula there was an excess for the current and the preceding month, while in the south Atlantic states, the Lake regions, upper Mississippi valley, northeastern slope of the Rocky Mountains, and the